The High School Instructor

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Contents

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EDITORIAL

ADVANCEMENT IN AVIATION

DURING the past six years of the Great Economic depression Aviation has progressed remarkably. We seem to be at the entrance to an era of regular trans-oceanic air transportation. The Pacific has been crossed in record time by a super passenger aeroplane, and pioneer work in forming an airbridge across the Atlantic has reached the stage where definite plans are being made for regular passenger service.

Soon we may expect to realize an unbroken air service encircling the globe. Land services in all portions of the world are already well-established. Passenger flying across America, in luxuriously appointed cabin planes, is an accomplished feat. Similarly services have been set up across Europe and Asiatic Russia. The routes from the European capitals south-eastward across Asia to India, Australia, and New Zealand, with easy connections for points in China, Japan, and the Phillipines have been well established. The achievement of the *China Clipper*, therefore indicates the immediate possibility of a globe-encircling service.

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WAKE ISLAND

IN preparation of the proposed Pacific air route, the Pan-American Lines sent a survey steamer in April, 1935, to inspect a number of islands selected as landing places for a proposed transpacific air service. Its first stop was Honolulu, followed in turn by calls at Midway Island, Wake Island, Guam, and the Phillipines.

Least known of all these isolated "stepping-stones" along the 8,500 mile route to the Far East is Wake Island. It is a mere speck about 2,200 miles west of Honolulu in almost a direct line to Manila. Although discovered by the British in 1796, the island has never had any permanent settlers. The island has been hardly more than a name known to navigators plying between the Hawaiian Islands and Guam as one of those very dangerous spots which they must avoid.

LONDON'S EXHIBITION HALLS

World buyers of industrial products annually flock to London to visit the British Industries Fair held at Olympia and White City. East ... West in these great exhibition ... or there are buyers from ... of the globe, from Per... and ... from Canada and Pales... from France and Australia. They are guided through two miles of st... by a corps of interpreters, and the catalogue is printed in nine languages.

Olympia is a huge, glass-roofed building covering six acres. Two outstanding events of the spring season in London are held here—the Royal military Tournament and the Horse Show. The following is a partial list of exhibitions held in this hall in 1935; furniture-trades, ideal homes, terrier club, confectionery, radio, shipping, engineering, automobile, Horticultural Society's Flower Show, and a circus and fair.

In nearby White City are held under flood lights various games and contests, rugby, dog racing, as well as many exhibitions.

Drab Islington, one of the most populous suburbs of northern London, houses the Royal Agricultural Hall. Over its three acres of space are spread exhibits of cattle, horses, dogs, used-cars, shoes and leather goods, brewery products, and models of public works.

At Wembley the great British Empire Exhibition was held in 1924-25. It was to London what "A Century of Progress" was to Chicago. Now all that remains of its halls, oriental temples, artificial lakes, fountains and walks is the Empire Stadium. This huge bowl seats 100,000 spectators, and is the scene of Eng...d's great annual soccer game, the ... Final. At this time the onlooker is ... to a thrilling sight. The King ... Prince of Wales present cups ... als to the players, bands play ... tunes, thousands of voices join in community singing, airplanes zoom overhead, and England becomes as wildly excited as this continent does for the World Baseball Series.

The most imposing and romantic

Topics of Interest

FRANCO-BRITISH PEACE PROPOSALS

Pierre Laval, Premier of France, and Sir Samuel Hoare, Foreign Secretary of Britain, met at Paris in the second week of December, 1935, and formulated peace proposals which were submitted both to Italy and Ethiopia. The proposals were condemned by world opinion long before they were submitted to the League of Nations, principally on the ground that the sponsors were sacrificing the League principle of collective action in support of League members whose territory was being encroached upon by an aggressor nation, and also on the ground that the proposals conceded more to Italy than she would likely get if she were victorious in the present conflict with Ethiopia.

The peace proposals made by Laval and Hoare were as follows:

Territorial exchanges: Cession to Italy of Eastern Tigre Province, limited on the south by the River Gera, on the north by a line between Aksum and Adawa, giving Aksum to Ethiopia and Adawa to Italy. Rectification of the frontier between Danokil Province and Eritrea, leaving Aussa to the south and extending the Ethiopian territory to give Ethiopia access to the sea. Rectification of the frontier between Ogaden Province and Italian Somaliland, starting with the point of intersection of the Ethiopian frontier with Kenya colony and with Italian Somaliland. A general line to the northwest from Webbe Shibeli which would leave Gorshai to the east and Warandab to the west, and would join the frontier of British Somaliland and the 45th meridian, the rights of the tribes of British Somaliland to the use of the wells to be preserved. The outlet to the sea to be granted to Ethiopia was to be from Ethiopian territory to the Port of Assab. This corridor the Ethiopians were to hold in absolute sovereignty.

Zone of colonization: The governments of Great Britain and France will exert their influence with the Emperor of Ethiopia to have constituted in Southern Ethiopia a zone of expansion and colonization reserved to Italy. This zone extending westwards from Italian Somaliland with the new boundary lines defined as above would take in more than one-third of present Ethiopian territory. Within this zone Italy would enjoy certain economic rights which might be administered by a private company.

Social welfare: The company or entity charged with the administration of this zone would be obliged to contribute to the economic development of the zone and devote part of its income to the expense of improving the social welfare of the native population. These peace proposals were rejected both by Italy and Ethiopia, and the League of Nations gave very little consideration to them.

EDEN BECOMES FOREIGN SECRETARY

When the Hoare-Laval peace proposals were first announced, they created such a furore that Sir Samuel Hoare was forced to resign as Britain's Foreign Secretary. His place was filled in the Cabinet by Sir Anthony Eden, who till then was Britain's minister for League of Nations affairs. His appointment was hailed by supporters of the League of Nations as an indication that Britain was anxious to redeem herself in

the eyes of the world as a one hundred per cent. supporter of the League, her half-hearted backing of Hoare's share in the peace proposals having aroused the suspicion of the smaller nations who were members of the League.

Anthony Eden's rise to full responsiblity for the conduct of British foreign policy has been steady during more than a decade, and meteoric in its latest stages. It is actually two years since his name has begun to be associated with foreign affairs. A little over a year ago he was sent by the British government on a good will tour of the capitals of Europe. He took an active part in not only preaching but practising the League doctrine of collective security in applying it in the Yugo-Slav-Magar and Saar conflicts. It was mainly on his initiative that the first League army took the field in the Saar.

Sir Anthony is the youngest Foreign Secretary in 84 years. He is the second son of a British landed baronet. The circumstances of his birth would suggest that he would lean towards "imperialism", but he has been most aggressive in seeking to check Italy's disregard of the League's covenant. In a national government which somewhat dillied-dallied in the matter of awarding Italy's aggression, he stood out against the Hoare-Laval peace proposals and almost resigned on the issue.

Eden's career in recent years differed little from that of others in his class. From Eton he went to France. He became Brigade Major before he was 21. At the end of the war he was the youngest captain in the British army. He stood for parliament twice before being elected for Warwick and Leamington. In 1933 he became Parliamentary Under-Secretary in the Foreign Office. In 1934 he became Lord Privy Seal. Next he became Minister to League of Nations affairs, and now at the age of 38 he is Britain's Foreign Secretary.

SCHOLARSHIP

Of interest to teachers is a report from Ottawa that a bill providing for scholarships for high school graduates will be submitted to the House of Commons at the coming session. The suggestion is that 1000 of these scholarships will be distributed to deserving students graduating from the secondary schools of the Dominion. Students receiving the scholarships, must, however, show by their scholastic record that they are likely to benefit from a university training.

It is pertinent to mention here that Canada has been lagging behind some other sections of the Empire in the matter of helping to train for future leadership those of her brilliant and younger citizens who for financial reasons are unable to take advantage of higher training. For years the city of London, England, has been helping not only her brilliant secondary school graduates, but also those graduating from the elementary schools who indicate that they possess exceptional capabilities. Universities in Canada, of course, have for years been awarding scholarships, but the number given does not even begin to take care of the need. Especially is this true at the present time when, due to lack of opportunity, the student is unable, on his own efforts, to help to defray the cost of advanced training.

A few days ago Queen's University announced that it was establishing six annual Dominion scholarships of the value of $300 each. It is to be hoped that the lead given by Queen's will be followed by other universities. An increased number of university scholarships together with the proposed Dominion Government scholarships will go a long way towards filling a long-felt need.

POLAND IN INTERNATIONAL AFFAIRS

Twenty years ago Poland as a national unity did not exist. Today she is the sixth largest nation in Europe, with a population of nearly forty millions. Her strategic position, between Soviet Russia with her novel form of government on the one hand and militant Germany on the other, makes this young nation a power to be reckoned with in international affairs.

But though the modern Poland is a nation of so few years, the Polish people have for centuries had intensely patriotic feelings and a keen awareness of their racial unity. Once before Poland was a great power. In the sixteenth and seventeenth centuries its territories covered the larger part of eastern Europe, extending from just east of Berlin to the Sea of Azov, and from the Crimea nearly to the Gulf of Finland. Then came internal troubles and weak rulers which enticed the greedy powers on her western and eastern borders to divide her rich territories among themselves. Prussia, Russia, and Austria, desiring expansion, completely destroyed this once great power in the three partitions of 1772, 1793, and 1795, and legalized the theft at the Congress of Vienna in 1815.

An intense flame of nationalism continued to burn in the hearts of the Polish people. After a century and a half of oppression came the great day in November, 1918, when Marshal Joseph Pilsudski returned to Warsaw to be acclaimed as chief of the new, independent state. The Treaty of Versailles fixed the western boundary, and after a serious struggle with Russia, the Eastern boundary was fixed by the Treaty of Riga in 1921.

Poland had many handicaps, but under Pilsudski's leadership, she developed rapidly. The land had been devastated by long years of warfare. Differences and divisions had been created between different sections of the country which had been long dominated by Russia, Prussia, and Austria, each with its different systems of government, education, and law. Even today the standard of living in eastern Poland is in sharp contrast with the higher standard in the more prosperous west. Besides there are racial differences which cause unrest. The most restless of the non-Polish races in the new nation are the Ukrainian in the southeast and the White Russians in the east.

When the Versailles Treaty created the new nation it left nations jealous to repossess lands which had once been theirs. Polish statesmen have succeeded in establishing peaceful relations, particularly with Germany and Russia, and last year these two nations together with Great Britain, provided the best markets for Polish trade.

Pilsudski, until his recent death, was the hero of his country. He preferred not to take the Presidency but to work quietly behind the scenes. The office was made particularly attractive just before his death, since the new constitution makes Poland an autocracy and gives the President the powers of an absolute monarch.

Poland has made vast strides in economic development parallel with her political growth. The devastations of war have been repaired, agriculture has been revived, factories have been built, the currency has been stabilized and railways have been extended and improved. The

railways have been made to conform in gauge with those of the great countries surrounding her, so that Poland is now bound together and to the rest of Europe by her railway system. A new railway from Upper Silesia along the Polish Corridor to the new Baltic port of Gdynia assures her economic freedom. The port of Gdynia, an artificial port and only ten years ago a shabby fishing village, is now a modern city whose harbor can accommodate fifty vessels at a time. The volume of trade passing through Gdynia increased from 10,000 tons in 1924 to 6,100,000 tons in 1933. Exports consist chiefly of coal, lumber, sugar, grain, dairy and pork products; imports are cotton, foodstuffs, metals, and machines. Her coal resources are very rich and form the basis upon which her industry rests. We can count on Poland to work continuously in the cause of peace and peace is necessary to her development.

Grade IX Arithmetic

Taxation

The Dominion of Canada is divided into nine provinces. Each province has smaller divisions which are frequently referred to as municipalities. In Saskatchewan there are two kinds of municipalities, namely, urban and rural. All cities, towns and villages in the province are referred to as urban municipalities, while the part of the province that is not organized into cities, towns and villages is divided into districts which are called rural municipalities. The Dominion, each of the provinces and each of the municipalities has a government that administers its affairs. Each government provides the people coming within its sphere of jurisdiction with certain services. To provide these services money is required. This money is raised by each government by means of taxation. There are two kinds of taxation, direct and indirect. When the taxpayer pays the tax directly to the government the tax is a direct tax. For example, when a property-holder in a city pays taxes on his house and lot he pays a direct tax. When the taxpayer does not pay the tax directly to the government, the tax is said to be an indirect one. Thus, the government collects a sales tax on most goods sold. The person who buys the goods, usually called the consumer, pays the tax as a part of the price which he pays for the goods although the tax itself is collected by the government from the merchant. The sales tax is, therefore, an indirect tax.

The Dominion and some of the provincial governments levy both direct and indirect taxes. The municipalities in the main levy taxes on real property only. In some provinces the municipalities levy taxes on income, although in recent years, this field is being invaded by the provincial taxing authorities. In Saskatchewan the municipalities are allowed to levy taxes on real property (land and buildings) businesses and special franchises.

How do the taxing authorities in any municipality determine the amount of annual taxes that must be paid by any individual? In a city there are generally the following departments each rendering certain definite services to the citizens. The departments are the police, fire health, education, engineering, parks and recreation, library, tax, and electrical. At the beginning of each year the head of each of these departments makes up an estimate of the amount of money that is necessary to run his department for the year. These estimates are sent to the commissioner who presents them to the council at a meeting called for the purpose of considering the estimates for the ensuing year. At this same meeting of the council the assessor, head of the tax department, will furnish the council through the commissioner, with the total value of assessed property in the city. In arriving at the assessed value of real property land is valued at 100% of its fair value, while buildings on the land (improvements) are valued at a per centage which usually ranges from 30% to 60% of their fair value. Let us assume that the total money needed by all the departments for one year is $1,000,000 and that the total assessed value of property in the city is $25,000,000. This means, then,

that property valued at $25,000,000 must contribute in taxes a sum of $1,000,000. It is an easy matter now to determine how much an individual with property valued at say $3500 has to pay. Thus

Property valued at $25,000,000 must pay in taxes $1,000,000
Property valued at $3500 must pay in taxes

$$\frac{1,000,000 \times 3500}{25,000,000} = \$140$$

It is usual for the council after the estimates have been fully considered to strike a rate. The rate is usually expressed as so many dollars of taxes on each 1000 dollars of assessed value. Thus, above, the tax paid by $1000 of assessed property is

$$\frac{1,000,000 \times 1000}{25,000,000} = \$40$$

Now $40 on $1000 is the same as
$4 on $100
or 4 cents on $1
or 40 mills on $1

Since there are 10 mills in 1 cent we see that $40 on $1000 is the same as 40 mills on $1. In the example given above the council would be said to have struck a rate of 40 mills. However, we find it more convenient to express the rate as so many dollars on each $1000 of assessed value.

In questions of taxation there are usually three factors involved, namely, the assessed value of the property, the rate of taxation, and the taxes. If, therefore, we know any two, the other can be found. The first thing then, the pupil must master is the ability to determine one factor when the other two have been given. Thus, given that the assessed value of a piece of property is $4000 and the rate 30 mills, the taxes to be paid are $30/1000 \times 4000 = \$120$. Again, given that the taxes are $180 and the rate 45 mills, the assessed value of the property is $180 \times 1000/45 = \$4000$. Finally, given that the taxes are $130 and the assessed value is $3900 the rate is $130/3900 \times 1000 = 33\ 1/3$ mills.

Now do questions 1-18, pages 153, 154, 155.

Income Tax

As already stated, the Dominion government and some of the provincial governments levy an income tax. Like the property tax discussed above this is a direct tax. Briefly the principles which underlie this tax are: First, the whole of a person's income is not taxed, and secondly the part of the income that is taxed is not all taxed at the same rate. Thus, in the case of the Dominion income tax a married man or a single man with certain dependants is allowed an exemption of $2000. By an exemption we mean that a portion of the income is not taxed. At the present time a married man without children making a yearly income of $2800 would receive an exemption of $2000. In other words for the purposes of taxation this man's net taxable income would be $800. In the case of a single man without dependants and making $2800 his exemption would be $1000 and hence his net taxable income would be $1800. The taxpayer is allowed to make deductions for dependants. Thus a married man is allowed to make a deduction of $400 for every child under 21 years of age. Where the taxable income is in excess of $5000, the tax as calculated in accordance with the rates set out below must be increased by 5%. There is a distinction made between "earned incomes" and "investment in-

comes". The latter are subjected to a surtax. That is, after paying taxes at the same rates as "earned incomes" investment incomes must pay additional taxes. An *earned income* is defined to include salaries, wages and other personal earnings including income derived from a profession, vocation or calling. *Investment income* is income derived in any other way than as defined under "earned income". Generally, investment income is the interest derived from the investing of money in securities such as stocks and bonds.

The rates to be applied to the net taxable income, that is, the income left after all deductions have been made are as follows: On the first $1000 or any part thereof 3%; on the next $1000 or part thereof 4%. The rates continue to increase by 1% for every additional $1000 of net taxable income. Thus the 6th $1000 would be taxed at a rate of 6% and the 11th $1000 at 11%.

Suppose a person's net taxable income is $4700. On the 1st $1000 he pays $30 taxes; on the 2nd $1000, $40; on the 3rd $1000, $50; on the 4th $1000, $60. The $700 are a part of the 5th $1000, so the tax on $700 is calculated at the rate 7%. The tax is, therefore, $49. The total tax is $229.

In the above example, if the taxable income were $5300 and after the statutory exemption of $1000 (being a single person) is deducted the net taxable income is $4300, then the person must pay 105/100 (30+40+50+60+21) = $211.05.

We note that he pays an additional 5% because his taxable income is over $5000.

Example 1. What tax will a married man with three dependant children pay whose salary is $5600?

Exemptions: (married) $2000
            (dependants)   1200
                              _____
            Total $3200

Net taxable income 5600 − 3200 = $2400
Tax = 30+40+16 = $86.

Now do questions 1-6, page 157, applying the rates set out above.

Example 2. An unmarried man has an "earned income" of $6600 and an "investment income" of $4300. Determine his income tax.

As to General Tax:
    Exemptions: $1000
    Net taxable income 6600+4300 − 1000 = $9900
    General Tax = (30+40+50+60+70+80+90+100+110+108)105/100
               = $774.90

As to Surtax:
    Income: $10900
    Exemption: 6600
                        _____
    Income subject to surtax $ 4300
    Surtax 105/100×2/100×4300 = $90.30
∴ Total tax = 774.90+90.30 = $865.20

In determining the surtax a person is allowed to deduct from his income as it stands before he takes off the exemptions extended to married or single persons and for dependants whichever of the following affords him the greatest exemption:

    (1) all income up to $5000, or

(2) Earned income up to but not exceeding $14,000, or

(3) Income equal in amount to the sum of exemption and allowances for dependants to which the individual is entitled.

In example 2, the man's income before taking off the $1000 to which a single man is entitled is $10,900. He is allowed to exempt earned income up to $14,000 so he takes off his earned income of $6600 and pays a tax at the rate of 2% on the investment income of $4300. The 5% additional tax is also applicable to surtax.

If in example 2 the man were married and had 12 dependents, his surtax would be as follows:

Income:	$10900
Exemptions: (married)	2000
(dependants)	4800
Total exemption	$ 6800
Income subject to surtax:	$ 4100

Surtax 105/100×2/100×4100=$86.10

Note that his total exemption is greater than his earned income, hence he makes use of this sum under (3) above rather than the $6600 of earned income.

The rates on portions of incomes subject to surtax are 2% on the first $10,000 and 3% on the next $10,000, etc.

Provincial Income Tax

The provincial income tax is modelled on the Dominion tax, the rates and exemptions being different. The Province of Saskatchewan does not levy a surtax.

We would suggest that you write to the Provincial income tax department for income tax forms and that you use them to calculate the answers to questions 1-6, page 157, at the provincial rates.

Customs Duties and Excise Taxes

Customs duties and excise duties are other forms of indirect taxation. For explanations of these forms of taxation see page 158 of the text.

In determining the ad valorem duty note that it is always calculated on the invoice price. Thus when goods are shipped into Canada from another country, the goods are accompanied by an invoice or statement setting out the price placed on the goods at the point from which they were sent. The duty is a certain percentage of the invoice price.

Now do questions 1-15, pages 159 and 160.

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exhibition hall in London is the Crystal Palace. It is a mammoth edifice of glass and iron, 1608 feet long, consisting of a great central hall with aisles and two transepts. At either end is a water tower 282 feet high. The Crystal Palace was originally built in Hyde Park for the great exhibition of 1851, but three years later it was moved to its present site on a hill at Upper Norwood, overlooking southeast London. The Crystal Palace is used for flower, dog, and poultry shows. Radio research is carried out in one of its towers. The 200 acres of grounds present an interesting mixture of ancient and modern with tennis courts, walks, statuary of various ages, row boats, life-size models of prehistoric animals in their geological formations, and finally the triennial Handel Festivals held in the Handel Orchestra Auditorium which can accommodate 4000 persons.

Grade IX Literature

THE LADY OF THE LAKE
Review Questions, Canto I

1. What is meant by the *Harp of the North*?
2. What does Scott say about Scottish song in ancient days?
3. What is the author's attitude toward the work he is beginning?
4. Trace on the map the course followed by the stag in its flight from the huntsmen.
5. Write definitions for each of the following: antlered monarch, heathery couch, tainted gale, copse, cairn, sylvan war, varied realms of fair Menteith, Saint Hubert's breed, vindictive, quarry, flinty spire, thunder-splintered pinnacle, Shinar's plain, cupola, minaret, Naiad, falchion.
6. When and where did the chase begin?
7. Where did the deer seek refuge? How long was this after the chase started?
8. What befell the single huntsman who was left?
9. What effect did his surroundings have upon him?
10. Why did he blow his horn at the edge of the lake?
11. What happened when he blew his horn?
12. Whom had Ellen been expecting?
13. What makes the huntsman liken his surroundings to fairyland? Pick out all expressions which carry out the comparison with fairyland.
14. What happened as the hunter was entering the Lodge?
15. Describe his dream. Why was he so troubled in sleep?
16. Name those in Ellen's household at the time of the arrival of the huntsman.

OUTLINE—CANTO II (Events of Tuesday)

(1) The first part pays tribute to the genial influence of the morning; all nature is revived and cheerful. Under this cheerful influence old Allan-bane, the minstrel, sang his song which was inspired by the departure of the stranger.

The Departure of the Stranger Guest.

(2) and (3) *The song.* Men forget benefits received as readily as spray dashes from the rowers' oars, or as the disturbance made by the boat's passage through the water disappears. So if the stranger thinks no more of the "lonely isle", he will but follow the normal manner of mankind. The singer wishes for the stranger success and pleasure—high place in royal court and military leadership; outdoor pleasures, true friends, and love. These might naturally cause him to forget the isle.

But, continues the singer, if one from the Highlands should be in need in the city, and if it is in the stranger's power to help him, then may he remember the kindly treatment he received on the island. Or if the stranger should meet with adversity, in difficulty

and forsaken by friends, he is welcome to return to the island where he will find friends.

(4) Note the vivid picture in this scene. Spend some time imagining the details and build up in your mind a very clear picture. See the old white-haired harper reclining against an old tree, the two looking as if they had grown old together. See the rapt look on old Allan-bane's face as he plays and sings. Note the complete stillness of his attitude.

(5) Complete the picture of the previous stanza. Ellen's attitude forms a contrast to that of Allan-bane. Picture the rocks, and the spaniel barking at the ducks on the lake. After having so visualized the picture in these two stanzas it is a splendid composition exercise to reproduce the picture in good prose making use of any words you may have learned from the passage.

(6) The farewell salute—Ellen's admiration for the huntsman—the name of her lover introduced. Ellen's self-reproach and her attempt to make amends.

(7) When Allan-bane tried to play martial music in praise of the Graeme, what strange thing happened? What did Allan-bane fear this meant?

(8) When had it happened before? There were two occasions: (a) when Ellen's mother had died; (b) when the Douglases were driven into exile. In part XXXV of Canto I we had a hint that those dwelling on the island were the exiled Douglases. Here the suggestion is repeated.

(9) Note carefully Ellen's attempt to comfort Allan-bane by her interpretation of the confusion of his music. He is familiar with all forms of Scottish music, therefore it is not to be wondered at if at times melodies come spontaneously from his harp to suit his mood. It may be that he will attempt a war-march but his mood may induce a funeral song. Note her reference to their life on the island, the tribute to her father's character, and her own contentment. Her father has a rugged strength of character capable of withstanding misfortunes as the firmly-rooted oak withstands the tempests. This stanza shows Ellen in one of her most delightful moods. She is aware of the difficulties of herself and family, but she is lighthearted and contented with the simple life she lives.

(10) Note the effect of Ellen's words on the old minstrel and his intense love for her expressed in his looks and his words wishing for her a return to that place in society which her family formerly occupied. Make yourself familiar with the tradition that made a *bleeding heart* the emblem of the Douglas family.

(11) Ellen reiterates her satisfaction with her present life. She has everything a lady at court can have to make her truly happy— the outdoor life equals court life, she has music and dancing, and she has suitors. Note that her one of the leading characters of the stody is mentioned. He is the ruthless Sir Roderick Dhu, chief of the clan.
Explain each of the following: Saxon scourge, Clan Alpine's pride, terror of Loch Lomond's side, Lennox foray.

(12) Note the information given concerning Roderick and form an estimate of some phases of his character:

(a) He is feared by all who know him.
(b) He had once been a courtier, but is exiled because he had slain a knight in Holy-Rood Palace.
(c) He is fearless.
(d) He rules his clan sternly.
(e) He had given refuge to the exiled Douglas and was protecting him from Ellen.
(f) He sought to marry Ellen, but because they were first cousins (as you will learn later) special permission had to be obtained from the head of the church.
(g) Ellen's relations with Roderick are fraught with danger.

(13) Ellen acknowledges her debt to Roderick, but would endure any suffering rather than marry him, for there is that in his character which she cannot love. Lady Margaret is Ellen's aunt.

(14) Ellen further characterizes Roderick. She pays tribute to his noble traits but condemns what is evil. Roderick is an interesting mixture of contradictions.
(a) Brave but wild.
(b) Generous except when dealing with an enemy or moved by jealousy.
(c) Loyal to friends but merciless to foes.
(d) Liberal, unselfish in dividing the spoils, but merciless and murderous in his attacks on innocent hamlets.
(e(His virtues serve to make faults seem greater. Ellen has feared him since childhood, and now the very suggestion of marriage with him is hateful to her.

(15) The conversation changes to the stranger guest who has just departed. Allan-bane believes his coming bodes ill. He explains the significance of the sword dropping from the scabbard.
(a) It may foreshow a secret foe.
(b) It may be he was a spy who will betray the hiding place of Douglas.
(c) If he is neither friend or foe, he may arouse the angry jealousy of Roderick. At the Beltane game (May Day—May 1) Roderick's jealousy had flared when Malcolm led off the dance with Ellen as his partner; and blood would have been shed had not Douglas intervened. Just at this moment the old minstrel catches the strains of the distant pibroch (martial music of the bagpipes).

The Arrival of Roderick and His Men.

(16) Parts XVI to XXI relate the arrival of Roderick and his men upon the island. A valuable form of exercise to develop literary appreciation and power of expression is paraphrasing. A paraphrase is an exact reproduction in prose of the thought of a passage of poetry. The following is a paraphrase of part XVI to serve as a model for further exercises of this kind:

As the old minstrel gazed in the direction of the distant music he saw far up the lake four dark specks which, as they approached, took on the form of manned and masted barges. They were coming from the direction of Glengyle and were making directly for the island, and as they passed the point of Brianchoil the sun, shining more fully upon them, revealed the emblem of Sir Roderick. It is

a thrilling sight as they draw nearer and nearer; spears, pikes and axes flash in the air; the brightly coloured, picturesque tartans dance and wave in the breeze; as the rowers sweep their oars, bonnets sink and rise rhythmically, and the wave is shattered into spray. Most thrilling of all is the sight of the pipers on the bow sending the music of their beribboned pipes across the lake.

(17) The varied forms of the music.
   (a) Mellowed at first by distance.
   (b) On nearer approach the music grows louder and breaks into the gathering song of the clan expressing in turn:
      (i) mustering hundreds;
      (ii) merry marching on;
      (iii) closing battle;
      (iv) the thick of battle;
      (v) victory;
      (vi) lament for the dead.

Make a paraphrase of this part similar to that given above.

(18), (19), and (20) As the boats bear down upon the island the men are singing in praise of their leader and their prowess. The first stanza of the song is a wish for the continued strength and growth of the clan; the second stanza expresses confidence in its strength; the third stanza expresses the terror spread by the clan in surrounding districts; and the fourth stanza suggests a hoped-for marriage between Ellen, "the rosebud that graces your islands" and Roderick their chief.

(21) Lady Margaret, Roderick's mother, is eager to meet her son and to please him by having Ellen to greet him. In part XIII of Canto II we learned that Lady Margaret was the sister of Ellen's mother. Thus the relationship of Ellen and Roderick is established. Ellen is going reluctantly to meet the chief when the sound of her father's bugle saves her the unpleasant duty, and she and Allan-bane go to bring her father from the mainland.

The Arrival of Douglas and Malcolm.

(22) Note the great love of father and daughter for one another. Memorize the first eight lines of this part. Ellen was so eager to welcome her father that she did not notice her lover standing aloof.

(23) This part expresses the appreciation of Douglas for the affection and loyalty of the old minstrel. He is happier in this affection and the love of his daughter than when at the height of his power and fame. Paraphrase this passage.

(24) Note: (1) Ellen's confusion at being praised before her lover; (2) her attempts to hide her confusion; (3) Malcolm's worshipful admiration.

(25) Description of Malcolm:
   (a) Athletic build—slender, firmly knit, graceful limbs.
   (b) Curly, flaxen hair—blue bonnet.
   (c) Keen of perception.
   (d) Skilled hunter and mountaineer—hardy.
   (e) Mental qualities—lively, ardent, frank, kind, happy, light-hearted, scorned wrong, loved truth, gave promise of being of greater leader among the Highlanders than Roderick Dhu.

Science Tests

Grade IX

1. Make a numbered list of the words or phrases necessary to complete each of the following statements correctly.

(a) Sound arises from bodies in (1)..............
(b) Sound travels through air by means of (2)..............
(c) Sound may be carried by (3)..............
(d) Sound cannot be transmitted through (4)..............
(e) Sound travels through air at the rate of (5)..............
(f) A musical note arises from (6).............. while a noise arises from (7)..............
(g) The pitch of a musical note depends on (8)..............
(h) Echoes are caused by (9)..............
(i) The length of a closed tube which will (10).............. with a certain note must be ¼ the wave length.

2. Write a complete illustrated description of an experiment conducted to determine the frequency of a tuning fork.

3. (a) Draw a diagram to show the manner in which water waves travel. Show the motion of a single particle of water.

   (b) Draw a diagram to show the manner in which sound waves travel. Show the parts of the wave and the motion of a single particle.

   Answers: 1. (1) rapid vibration, (2) waves, (3) all material substances, (4) a vacuum, (5) about 1100 ft. per sec., (6) regular periodic vibrations, (7) irregular vibrations, (8) the number of vibrations per second, (9) the reflection of sound from hard surfaces, (10) resonance.

Grade X

1. (a) Draw a labelled diagram of a common lift pump.
   (b) Referring to the above diagram specifically describe the action of the lift pump.
   (c) What is it that causes the water in the well to flow up the pipe?

2. (a) Name three uses to which compressed air may be put.
   (b) Draw a diagram to illustrate one of the uses named in (a).
   (c) Write a description of the action of the machine drawn in (b).

3. Draw a diagram of a machine by which falling water may be used to generate power.

Grade X Written Language

Answers to Test—The Roll Call of Honour

Check each one correct and multiply by 2.

I. (4); (10); (6); (7); (1); (8); (11); (5); (2).

II.—(1) Sea. (2) liberator; South America; Spain; Venezuela. (3) Kansas; Connecticut; Harper's Ferry; Robert E. Lee; Confederate. (4) log cabin; Nolin Creek; Kentucky; Springfield; Mary Todd; Republican. (5) South (Confederates); Fort Sumter; Charleston; South Carolina. (6) General Grant. (7) Nice; Merchant-skipper. (8) Brazil; Portugal; candle-maker; Sardinia-Piedmont; Austria; King Victor Emmanuel; Cavour; France (Napoleon III). (9) Glasgow (Blantyre); Africa; Dr. Moffatt; Henry M. Stanley; New York Herald; Victoria Falls; Zambesi. (10) Florence; Sebastopol (Crimea); (11) the Hawaiian Islands.

General Composition

Review what was said about punctuation in the last two numbers of the magazine and study carefully the following rules and exercises.

The colon is another form of punctuation used to indicate pauses, but the pauses are very marked breaks in the sentence structure. This form is seldom used within the sentence in present-day writing. It has a few very definite special mechanical uses which are given below. Its necessary uses between clauses of the sentence are covered by the following general rule:

Rule 12. The colon is used when the part of the sentence to follow is explanatory or illustrative of what has already been said in the sentence; e.g.,

(1) The archer vindicated their opinion of his skill: his arrow split the willow rod against which it was aimed.

(2) Many colors blended to beautify the mountain side: splashes of vermillion, various tints of yellow and gold, deep browns, and a few remaining greens.

The other uses of the colon are much more common:

Rule 13. Use the colon after the salutation in a business letter; e.g., My dear Sir:

Rule 14. Use the colon before a long quotation; e.g.,

When I paid my account, he whispered: "He is alone this morning, John, and in rare good humour. He hath promised the handling of poor Master Algernon Sidney".

Rule 15. Use the colon to introduce a list of details whether in running order or tabulated; e.g.,

(1) The following were the officers elected: President, Vice-President, Secretary, and Treasurer.

(2) The colon used above before Rule 13 is an example of its use with a tabulated list.

Exercises

1. Put colons and other punctuation where effective in the following:

(1) Send me the following books Wests World Progress Shakespeares Hamlet Scotts Lady of the Lake and Buchans The Path of a King.

(2) I am no longer an expert mechanic it is twenty years since I have used my tools.

(3) I was condemned on two counts I had not been present when the plans were made and I had not used my influence to make them successful.

(4) We still need these things for our journey 5 loaves of bread 3 pounds of butter 1 dozen oranges 2 pounds of sugar and some biscuits.

2. Punctuate the following passages:

(1) Oh please sir broke in Tom the rod isnt mine the doctor looked puzzled but the keeper who was a good-hearted fellow and melted at Tom's evident distress gave up his claim Tom was flogged next morning and a few days afterwards met Velveteens and presented him with half a crown for giving up the rod claim and they became sworn friends and I regret to say that Tom had many more fish from under the willow that may fly season and was never caught again by Velveteens.

(2) Never have I seen the like Macumazahn never he said the battles of my people are as the play of children to what this will be thinkest thou that they will fight it out.

(3) The keeper stops and looks up and then with a grin says oh be it you young master well heres luck now I tell you to come down at once and it will be best for you.

Rule 16. *The dash* is used in general to indicate abrupt breaks in the thought or structure and halting and hesitation in the expression. The following are examples of such breaks:

(1) He lacks courage and perseverance—what good quality does he not lack? (Change in trend of thought).

(2) A few of the boys—a very few, however—would not support the proposal. (An added explanatory phrase).

(3) Perseverance, faith, courage, sincerity—these are the qualities of a leader. (Before a summarizing statement).

(4) I gazed—and gazed—but little thought what wealth the show to me had brought. (Hesitation for dramatic effect).

(5) John B—— was born at H—— in 19——. (To mark omissions).

The dash is sometimes used to supplement the colon when used before a quotation or after a solutation. Its use, however, is not necessary.

Exercises

Punctuate the following:

(1) The teacher stopped at page where did the teacher stop?

(2) "It has grown by this time to the enormous sum and here he referred to his notes of 3,000,000 dollars."

(3) He will get a good position you never.

(4) Wealth position happiness all were his to command.

(5) On they came like a avalanche I saw her golden helm gleaming in the van our counter charges of cavalry entirely failing to check their forward sweep. (Make this sentence dramatic by the use of dashes).

Model Paragraph (Exposition)

Feudalism was a system of social relations based upon land. It grew out of the chaos which came upon Europe in the centuries following the collapse of the Roman Empire. The fall of Roman power flattened the whole political structures of Western Europe, and nothing arose to take its place. Every lord or princeling was left to depend for defence upon the strength of his own arms; so he gathered around him as many

vassals as he could. He gave them land; they gave him what he most wanted—a promise to serve and aid in time of war. The lord gave and promised to guard; the vassal took and promised to serve. Thus there was created a personal relation, a bond of mutual loyalty, wardship, and service, which bound liegemen to lord with hoops of steel. Feudalism shares with the Christian Church the honour of having made life worth living in days when all else combined to make it intolerable. It brought at least a semblance of social, economic, and political order out of helpless disorganization. It helped Europe to recover from the greatest disaster in all her history.

Analysis of Model

1. Topic.—An explanation of Feudalism.
2. General definition (Sentence 1).
3. Details.
   (1) Origin in fall of Roman Empire.
   (2) Each lord must depend on his own strength.
   (3) Gathering of vassals.
   (4) What the lord gave the vassal and what he got in return.
   (5) The results of this mutual help.
   (6) The value of feudalism (last three sentences).
Note that the last sentence is summarizing in character.

Unity and Coherence

Note that each sentence in the above paragraph adds to the explanation of feudalism. This adherence to the topic is unity. If what you have to say is to be clear and interesting, you must be careful to follow this principle. This is *unity*.

Note also that each sentence and part of a sentence is an outgrowth of what has gone immediately before. The sentences are connected in thought and follow one another in order of time and importance. Much use is made of connective words, such as the pronouns *it, he, him,* the adverb *thus,* and balanced sentences similarly constructed (Parallel structure). This principle of topical development or arrangement is *coherence* and is equally important with *unity* for clearness and interest.

Exercises

1. Write the above model paragraph omitting all punctuation. With your book closed put in the punctuation and then check your work with the text.

2. There are several kinds of exposition. The following are some types. Under each type is a list of subjects. Choose a subject from each list and write a paragraph. Check each one carefully for punctuation, spelling, grammar, unity, and coherence.
   (1) *Explanation of terms (definition)*. Define one of:
      (a) Athletics. (Give illustrations and values).
      (b) History. (Give a general definition, purpose, values).
      (c) Charity. (Give instances of true charity).
      (d) Education. (Give purpose, results).
   Begin each explanation with a general definition and then elaborate with details.
   (2) *Explanation of processes*. Explain one of:
      (a) How to build a raft.
      (b) How to kindle a camp-fire.

(c) How a gasoline motor operates.
(d) How a harvester operates.
(e) How to build a teepee.
(f) How a canoe is constructed.

(3) *Explanation of natural phenomena.* Explain one of:

(a) Earthquakes	(d) Ocean currents
(b) Volcanoes	(e) Winds
(c) Hoar frost	(f) Clouds

(4) *Exposition of propositions or views.* This is in the nature of argument. A statement is made as a truth and proof is supplied. Often description and narrative are used to make the exposition more vivid and interesting.

Expand the following statements by giving proofs:

(a) The earth is a sphere.
(b) Solids, when heated, expand.
(c) Truth is stranger than fiction.
(d) Honesty is the best policy.
(e) Many men are penny-wise and pound-foolish.

3. Outline and write an exposition of several paragraphs on one of the following topics.

(a) Radio.
(b) Plant Breeding.
(c) Wheat Marketing.
(d) The Canadian Form of Government.
(e) Home Planning.
(f) Town Planning.
(g) Rural Improvement.

Grammatical Drill

Non-modal verb forms

Some verb forms are not used as predicate verbs. Since they do not make statements of fact, statements not fact, or express commands, they do not have mood and so are called *non-modal* forms. These forms are: the participle; the gerund; and the infinitive. (Simple form of the verb).

(1) *The participle.* Note the use of the italicized word in the following:

I saw the boy *playing* ball.

The word *playing* has two functions: (1) it expresses action and so has verbal function; and (2) it describes *boy* and so has adjectival function. It is therefore a *verbal adjective.* Such a verbal adjective is called a participle. There are two kinds depending on the time of the action expressed. Those expressing present time always end in *-ing*, and are *present* participles. Those expressing past time have various endings and are called past participles; e.g., I saw the work *done.*

(2) *The gerund.* Note the use of the italicized word in the following sentences:

(a) *Playing* aids health.
(b) He likes *playing.*
(c) He grows strong by *playing* ball.

In (a) the word *playing* is subject of the verb; in (b) it is object of the verb; and in (c) it is object of the preposition *by.* In each of these

sentences, then, the verbal form has the value of a noun. It is therefore a *verbal noun* and is known as *a gerund*.

(3) *The infinitive* may be used as a noun, an adjective, or an adverb as in the following sentences:

(a) *To see* is to believe. (Noun, subject).
I want *to see* the game. (Noun, object).

(b) The work *to be done* is interesting. (Adjective, describing *work*).

(c) I came *to see* the game. (Adverb of reason, modifying *came*).

Exercise

Make a list of the infinitives, another of the participles, and another of the gerunds in the following passages and state the function and relationship of each:

1. The next day saw them running along the north side of the island, having passed undiscovered (as far as they were able to see) the castle which the Spaniards had built at the eastern end for the protection of the pearl fishers.

2. However, seeing the billows break here and there off the bay's mouth, they thought it better, for fear of rocks, to run by quietly, and then send in the pinnace and the boat. Yeo would have had them show Spanish colors, for fear of alarming the caravel; but Amyas stoutly refused, "counting it", he said, "a mean thing to tell a lie in that way, unless in extreme danger, or for great ends of state. So holding their course till they were shut out by rounding the point, they started.

GRADE IX LITERATURE

(b) Offers him shelter for the night but he is to leave in the morning.

(c) Orders safe conduct. Note that the laws of hospitality demanded that even an enemy must be allowed opportunity to get away from the district.

(d) He suggests that Malcolm will betray their hiding place to the King.

(e) Note that Malcolm's repartee (witty reply) is equal to Roderick's scorn. He refuses Roderick's hospitality.

(36) and (37) Malcolm takes immediate leave and swims to the mainland.

Problems

1. Write a paragraph entitled *Ellen's Dilemma* (Part 31).
Try to feel and put into words what was going on in Ellen's mind.
2. Describe the arrival of the clansmen at the island.
3. Write an appreciation of Allan-bane as revealed in Canto II.
4. What characteristics of Ellen does the Canto reveal? Illustrate.

Grade X Literature

JULIUS CAESAR

Review Questions (Act I)

1. Give a summary of information contained in Scene I important to an understanding of the subsequent action of the play. The following is an outline answer:

(1) It is a day of celebration of Caesar's victories.

(2) The victories have been over the forces of Pompey and those who carried on the struggle after Pompey's death. (Pompey was defeated at Pharsalia in 46 B.C. and was assassinated in Egypt. In 44 B.C. Pompey's sons were defeated at Munda in Spain. This victory broke for all time the strength of the Pompeian party).

(3) The people are easily swayed.

(4) It is the most sacred of Roman holidays—the Lupercalia.

(5) There is opposition in Rome against Caesar.

(6) This opposition is shared by some of the tribunes, who are officers of, and influential among the people.

(7) They fear Caesar's growing power.

2. Brutus, in his opposition to Caesar, trusts the sanity and good judgment of the Roman people. Judging by what you see of the people in this scene, was Brutus's trust justified? Discuss fully.

3. Why was Caesar anxious that Antony should strike Calpurnia while running the course? Do his motives serve the dramatist's purpose of establishing some justification for the acts of his opponents?

Make a full answer of this when the play has been read through.

4. What is the dramatic value of the appearance of the soothsayer?

(a) He creates suspense in the minds of the audience.

(b) Caesar's disregard of him shows the great Dictator's arrogance.

5. Show the skilful manner in which Cassius sounds out the opinions of Brutus before confiding in him regarding his project against Caesar.

(a) He complains of cooling friendship.

(b) He discovers Brutus's troubled mind.

(c) He readily notes by Brutus's reactions to the shouts of the crowd that Brutus would not wish Caesar to become a king.

(d) He seizes upon Brutus's high regard for honour to appeal to him on that basis.

(e) He portrays Caesar as a physical weakling.

(f) He emphasizes the equality in worth of Brutus and Caesar.

(g) He appeals to pride in family history and achievement.

(h) His words have had their effect so he heightens that effect by having Casca relate what had taken place at the ceremonies.

6. What is the dramatic purpose of Cassius' soliloquy at the end of Scene II?

(a) A soliloquy reveals the real motives and purposes of the speaker. Cassius has appealed to Brutus on as noble grounds as he could find. The audience might have a misconception of Cassius if his

selfish motives and slyness were not here revealed.
(b) The audience at once sense a tragic situation in which one of noble mind comes under the strong influence of one dominated be selfishness.

7. How does Shakespeare, through picturing a weak Caesar as seen by his enemies, hint at his real strength and greatness?
(a) Cassius unwittingly pays tribute to Caesar's fearlessness. While portraying Caesar as weaker than himself, he nevertheless admits Caesar's superior courage in attempting to swim the Tiber.
(b) Cassius mentions Caesar's literary abilities.
(c) Cassius admits Caesar's ability to control men.
(d) As Caesar enters he makes observations upon his detractor, Cassius. He shows that ability to read character which has made him master of Rome.

8. How does Cassius play upon Casca to win him?

Act II

Scene I.   The scene is in the orchard of Brutus's home.   A month has passed between the day of the triumphal procession and this night which is the eve of the Ides of March.   The last scene of Act I takes place on the same night as the incidents of this first scene of Act II. A great storm is raging.   This is part of the stage craft of the dramatist who arranges stage effects to deepen the influence of the action on the audience.   The storm is in keeping with the turbulence in Rome.   It induces in the minds of the audience a sense of tragedy and dire things to come.   Let us consider the incidents of this scene under four headings: 1. Brutus Tries to Justify his Position;   2. The Conference with the Conspirators;   3. The Interview with Portia;   4. The Entrance of Caius Legarius.

1. Brutus Tries to Justify his Position.
(a) Brutus is troubled in mind.   It is a late hour, for the boy Lucius cannot keep awake, yet Brutus prepares to remain in his study.
(b) His soliloquy is not an attempt to make up his mind.   It is evident that Cassius' arguments and his own contemplation have determined his course.   Caesar must die.   Here he is trying to justify his decision that Caesar must die.   It is evident that he is not satisfied that his decision is a righteous one, for if he were he would not thus argue with himself.   Let us analyze his soliloquy:
(1) Caesar must die.
(2) He has no personal grudge against Caesar.
(3) He is acting for the general (public) good.
(4) He fears Caesar might act differently if he had the power of an absolute monarch.
(5) Note his comparison of the adder.
(6) "I have not known when his affections sway'd
     More than his reason".
     Brutus is not aware that Caesar ever allowed his own desires (affections) to rule his judgment (reason).
(7) People are humble when climbing the ladder of ambition, but when they attain power they often become selfish and oppressive.
(8) Caesar may thus change.
(9) He cannot justify Caesar's death by any wrong Caesar has

done, so he justifies it on the basis of what he might be and do. Brutus's argument is woefully weak. If we were judged on this basis, who of us would remain unhung?

(c) Lucius brings the letter. Cassius has shrewdly arranged the place and time for such letter to be found. How opportune that this letter should be read by Brutus just when he was most worried about the righteousness of his decision. Its effect weighs on the side of his decision against Caesar and he becomes firmly resolved on his course.

(d) A knock at the gate. While waiting for Lucius to see who it is Brutus reveals how terrible had been the trouble of his mind. The following is a paraphrase of his soliloquy:

Since Cassius first stirred my mind against Caesar, I have not been able to sleep. The time intervening between the first suggestion of a dreadful deed and its enactment is as tortuous as a nightmare. During that time man's spirit and body are absolved in the deed to be done. His mind in turmoil is like a little kingdom suffering civil war.

2. The Conference with the Conspirators.

(1) Brutus comments on the best means of hiding conspiracy. It must be done by shows of friendship.

(2) Note the principal conspirators here present. Cassius has chosen his supporters and laid his plans well.

(3) Brutus shows his anxiety through his inability to rest. He has "been up this hour, awake all night".

(4) Cassius again emphasizes the high opinion held of Brutus by every noble Roman.

(5) The conspirators are introduced to Brutus.

(6) Brutus and Cassius hold a whispered conference, during which Cassius probably acquaints Brutus with the plan for Caesar's assassination.

(7) Note Brutus's objection to an oath. A Roman's word should be sufficient if his cause is honest. This passage indicates the idealism of Brutus.

(8) Questions of policy are discussed.

(a) Shall Cicero be approached? Brutus opposes. On what grounds?

(b) Cassius suggests the death of Mark Antony. Brutus opposes. Cassius, a keener judge of men than Brutus, sees in him a "shrewd contriver", one to be feared. Brutus sees only the need of destroying Caesar's power. Here he makes one of his greatest errors as far as the success of the conspirators is concerned, for by allowing Antony to live he preserves the life of the one who should bring about their destruction. This is the first of Brutus's major mistakes of policy. What is Brutus's argument? Cassius is not persuaded as to the wisdom of allowing Antony to live, yet he defers to Brutus.

(9) Plans are made to assure Caesar's attendance at the Senate. Decius Brutus, a young man who had the confidence of Caesar, will win his consent. Note that Shakespeare here introduces another weakness in Caesar, one of character—love of flattery.

(10) All the leading conspirators are to go to Caesar's house to lend weight to Cecius persuasive powers.

(11) The conspirators withdraw. Note how Brutus envies the carefree Lucius who can sleep so easily.

3. The Interview with Portia.

(1) Note the love of Portia for Brutus and her desire to share his burdens. Note how Portia reveals the mental anguish which Brutus has endured:

(a) He has not been able to rest.

(b) He has been, contrary to his nature, ungentle.

(c) He has not been able to eat, talk, or sleep and his disposition has been entirely changed. Note that Portia has been very considerate and refrained from urging herself too much upon him for fear of increasing his ill-humour.

(2) Brutus pleads illness but the discerning Portia sees that the sickness is in the mind. She pleads with him to share his troubles with her.

(3) She gives proof of her ability to endure suffering without complaining. While she has been talking she has suffered from a self-inflicted wound without showing her suffering. This she has done as proof of her ability to endure.

(4) Brutus promises to reveal his secret to her.

4. The Entrance of Caius Legarius.

The purpose of the dramatist in introducing Caius Legarius is to show the high regard in which Brutus was held by the people. Here is a sick man who yet is strong to do if Brutus demands and he does not even ask what the task is. He is willing to follow blindly the lead of Brutus.

Scene II.

1. Note the unintelligent superstition of Calpurnia as contrasted with the intellectual Portia.

2. Sum up the supernatural events which Calpurnia relates to Caesar.

(a) A lioness had whelped in the streets.

(b) The dead had walked.

(c) Supernatural warriors had been seen fighting in the heavens and blood had rained upon the Capitol.

(d) Ghosts had appeared.

3. How does Caesar answer her fears? Is he, too, somewhat superstitious? Is he sincere or boasting in his reference to his fearlessness?

4. Caesar shows his superstition by sending for a report from the augurers.

5. He nevertheless is determined to go to the Capitol.

6. Note Caesar's overbearing attitude toward the senators when telling Decius that he will not attend the Senate.

7. What was the content of Calpurnia's dream and its meaning as interpreted by herself?

8. Paraphrase Decius' interpretation of it.

9. What argument or persuasion did Decius use to finally determine Caesar to go to the Senate?

10. Note the friendly attitude of Caesar to the conspirators and they to him. They are acting in accordance with Brutus's characteriza-

tion of conspiracy: "Hide it in smiles and affability." The drinking of wine together was a pledge of friendship.

Scene III. This scene is introduced for two reasons:

(1) To show that information concerning the conspiracy had leaked out. In subsequent scenes note any further evidence of this fact.

(2) To add suspense. Will Caesar take the warning?

Scene IV. This scene reveals that Portia was not as capable of enduring Brutus's troubles as she had thought. Her anxiety almost betrays to Lucius the plans of the conspirators. Evidently Brutus had fully acquainted her with their plans.

The soothsayer is another possible source of warning to Caesar. Both Portia's anxiety and the words of the soothsayer heighten the suspense of the audience.

Problems

1. Paraphrase Brutus's argument justifying the death of Caesar.

2. Give a report of the meeting in the orchard between Brutus and the conspirators.

3. Write a note on the character of Portia as revealed in this Act. Use apt quotations.

Grade X Algebra

HIGHEST COMMON FACTOR AND LOWEST COMMON MULTIPLE

There is no topic in Grade X Algebra that is less well understood than the topic which forms the subject matter of this lesson. Students frequently have difficulty in distinguishing between what is a highest common factor and what is a lowest common multiple. Thus 7 is a common factor of 42 and 105, but it is not the highest common factor, as 3 is also a common factor of 42 and 105. Hence we say that the *highest* common factor of 42 and 105 is the product of the common factors 7 and 3, namely, 21.

To understand clearly what the lowest common multiple is, examine the numbers below.

18	**18**
15	16
12	14
9	**12**
6	10
3	8
	6
	4
	2

By the multiple of a number we mean a number that is obtained by multiplying the number by some integer. Thus 10 is a multiple of 5 because $5 \times 2 = 10$.

Examining the above columns of figures we see that 6, 9, 12, 15, and 18 are multiples of 3, while 4, 6, 8, 10, 12, 14, 16, and 18 are multiples of 2. The common multiples are 6, 12, 18 because they are multiples of both 3 and 2. Of the common multiples, namely, 18, 12, and 6, 6 is the *lowest*. Now do you understand what is meant by the lowest common multiple?

To get the highest common factor and the lowest common multiple of algebraic expressions, we must first factor the expressions, thus:

Example 1. Find the H. C. F. and L. C. M. of
$$m^3 - 8, \quad m^4n^2 - 4m^2n^2, \quad 4m^2 - 16m + 16.$$
$$m^3 - 8 = (m - 2)(m^2 + 2m + 4)$$
$$m^4n^2 - 4m^2n^2 = m^2n^2(m^2 - 4) = m^2n^2(m + 2)(m - 2)$$
$$4m^2 - 16m + 16 = 4(m^2 - 4m + 4) = 4(m - 2)(m - 2)$$

Examining the factors we see that the highest common factor is $m - 2$.

To find the lowest common multiple we must find an expression into which each of the given expressions must divide not only evenly but such that the factors of the quotient are factors of the remaining expressions. To get this lowest common multiple, the best procedure is to first set down all the factors of the first expression, thus,

$$(m - 2)(m^2 + 2m + 4). \qquad (1)$$

We next multiply the factors in (1) by the factors of the second expression which are not already set down, thus,

$$(m - 2)(m^2+2m+4)(m^2n^2)(m+2). \quad (2)$$

Then, we multiply the factors in (2) by the factors of the third expression which are not already set down, thus,

$$(m - 2)(m^2+2m+4)(m^2n^2)(m+2)(4)(m - 2). \quad (3)$$

Hence (3) written $4m^2n^2(m - 2)^2(m+2)(m^2+2m+4)$ is the lowest common multiple. Now do questions 1-18, page 181.

The Formal Method of Finding H. C. F. and L. C. M.

Sometimes we are asked to find the H. C. F. and L. C. M. of expressions that are not easily factored. Thus, find the H. C. F. and L. C. M. of $a^3 - 10a^2+33a - 36$ and $a^3 - 2a^2 - 23a+60$. Before doing this question, let us examine the following principles. We know that 5 is a common factor of 15 and 25. 5 is also a factor of 40 (the sum of 15 and 25), and of 10 (the difference of 15 and 25). If we take a multiple of 15, say 45, and add it to 25 or a multiple of 25, we see that 5 is a factor of the result. Hence we say that any number which is a factor of two expressions is also a factor of their sum or of their difference, or a factor of the sum or difference of their multiples.

Now in finding the H. C. F. and L. C. M. of the above expressions we note that neither expression is easily factored, both being of the third degree. We know, however, that if the two expressions have a common factor, that factor is also a factor of their sum or difference. The sum is an expression of the third degree and hence as difficult to factor as the given expressions. The difference is an expression of the second degree, and if factorable can be easily resolved into its factors. Thus subtracting

$$a^3 - 10a^2+33a -36$$
$$a^3 - 2a^2 -23a+60$$

and ——————————— we get
$$- 8a^2+56a -96$$

which factored gives us
$$-8(a^2 - 7a+12) \text{ or }$$
$$- 8(a - 4)(a - 3)$$

Now a common factor of the given expressions is either $- 8$ or $(a - 4)$ or $(a - 3)$. It cannot be $- 8$ for $- 8$ will not divide into $- 36$ or 60 (the last terms in the given expressions). If $a - 3$ is a factor, then by the factor theorem the expressions will become zero when a is put equal to 3. Thus,

$$a^3 - 10a^2+33a - 36= 27 - 90+99 - 36=0 \qquad \text{and}$$
$$a^3 - 2a^2 - 23a+60= 27 - 18 - 69+50=0$$

Therefore, $a - 3$ is a factor of both expressions. Now by long division,

$$\frac{a^3 - 10a^2+33a - 36}{a - 3} = a^2 - 7a+12$$

$$\therefore a^3 - 10a^2+33a - 36= (a - 3)(a^2 - 7a+12)$$
$$= (a - 3)(a - 4)(a - 3)$$

Similarly, $a^3 - 2a^2 - 23a+60= (a - 3)(a^2+a - 20)$
$$= (a - 3)(a+5)(a - 4)$$

Hence $(a - 3)(a - 4)$ is the H. C. F. and $(a - 3)(a - 4)(a - 3)(a+5)$ is the L. C. M.

Examine the text book, pages 184 and 185 for further examples. Note especially example 3, page 184, where before you subtract, you must multiply the first expression by 2. Now do the questions in exercises 90 and 91, pages 186 and 187.

Addition and Subtraction of Fractions

To add or subtract fractions in algebra, the student must be able (1) to find the L. C. M. of the expressions which form the denominator of the fractions; (2) to reduce the fractions to their lowest terms. As a matter of fact, the student must first make certain that any of the fractions that will reduce to lower terms are reduced before proceeding to add them.

Example 1. Simplify $\dfrac{x-y}{y} + \dfrac{2x}{x-y} - \dfrac{x^3+x^2y}{x^2y-y^3}$

We note that the last fraction will reduce.

Thus $\dfrac{x^3+x^2y}{x^2y-y^3} = \dfrac{x^2(x+y)}{y(x^2-y^2)} = \dfrac{x^2(x+y)}{y(x+y)(x-y)} = \dfrac{x^2}{y(x-y)}$

The L.C.M. of the three denominators is $y(x-y)$.

$$\therefore \dfrac{x-y}{y} + \dfrac{2x}{x-y} - \dfrac{x^2}{y(x-y)} = \dfrac{x^2-2xy+y^2+2xy-x^2}{y(x-y)}$$

$$= \dfrac{y^2}{y(x-y)} = \dfrac{y}{x-y}$$

Example 2. Simplify $\dfrac{1}{a-b} - \dfrac{1}{a+b} - \dfrac{2b}{a^2+b^2} - \dfrac{4b^3}{a^4+b^4}$

Here we note that none of the fractions will reduce. Since none of the denominators factor, the L. C. M. is their product. If we add them all at one time the numerator would be $(a+b)(a^2+b^2)(a^4+b^4) - (a-b)(a^4+b^4)(a^2+b^2) - 2a(a-b)(a+b)(a^4+b^4) - 4a^3(a-b)(a+b)(a^2+b^2)$. The result as you see requires a great deal of multiplication which could be avoided if the first two fractions were added and the remaining fractions added in turn. Thus,

$$\dfrac{1}{a-b} - \dfrac{1}{a+b} - \dfrac{2b}{a^2+b^2} - \dfrac{4b^3}{a^4+b^4}$$

$$= \dfrac{a+b-a+b}{a^2-b^2} - \dfrac{2b}{a^2+b^2} - \dfrac{4b^3}{a^4+b^4}$$

$$= \dfrac{a^2-b^2}{2b} - \dfrac{a^2+b^2}{2b} - \dfrac{a^4+b^4}{4b^3}$$

$$= \dfrac{2a^2b+2b^3-2a^2b+2b^3}{a^4-b^4} - \dfrac{4b^3}{a^4+b^4}$$

$$= \dfrac{4b^3}{a^4-b^4} - \dfrac{4b^3}{a^4+b^4}$$

$$= \dfrac{4b^3a^4+4b^7-4a^4b^3+4b^7}{a^8-b^8}$$

$$= \dfrac{8b^7}{a^8-b^8}$$

Example 3. Simplify $\dfrac{3}{x+4} - \dfrac{3}{x-4} - \dfrac{24}{16-x^2}$

The text refers to this example as a special type. The reason it is called a special type is because one of the factors of the denominator of the third fraction is $4-x$, while the denominator of the second fraction is $x-4$. It would be better if the student made no distinction between this and the earlier examples, merely recognizing that $4-x$ is the negative of $x-4$, and that the one is obtained from the other by multiplying by (-1). Thus $(-1)(4-x) = -4+x = x-4$. Hence when $4-x$ is divided into $x-4$ the quotient is -1. This being so, the common denominator of example 3 is $(x+4)(x-4)$.

$$\therefore \frac{3}{x+4} - \frac{3}{x-4} - \frac{24}{(4+x)(4-x)} = \frac{3(x-4)-3(x+4)-(-1)(24)}{(x+4)(x-4)}$$

$$= \frac{3x-12-3x-12+24}{x^2-16} = 0$$

Note that when we came to divide the denominator $(4+x)(4-x)$ into $(x+4)(x-4)$ we found that $4+x$ goes into $x+4$ once and $4-x$ into $x-4$, -1 times. Hence since we had to subtract the third fraction we have $-(-1)$ times 24, which is equal to $+24$.

Example 4. Simplify $\dfrac{1}{(a-b)(a-c)} + \dfrac{1}{(b-c)(b-a)} + \dfrac{1}{(c-a)(c-b)}$

In this example the student is advised in the text to use what is known as the cyclic order to find the L. C. M. Here again, it is better for the student to follow the same practice as followed in the simpler examples. We note that $b-a$ goes into $a-b$, -1 times. Similarly, $c-a$ and $c-b$ go into $a-c$ and $b-c$, respectively, -1 times. So we pick the L. C. M. as $(a-b)(a-c)(b-c)$

$$\therefore \frac{1}{(a-b)(a-c)} + \frac{1}{(b-c)(b-a)} + \frac{1}{(c-a)(c-b)}$$

$$= \frac{(b-c)-(a-c)+(a-b)}{(a-b)(a-c)(b-c)} = \frac{b-c-a+c+a-b}{(a-b)(a-c)(b-c)} = 0$$

Note that since the factor $b-a$ in the second denominator goes into $a-b$ in the common denominator -1 times, then the denominator of the second fraction goes into the common denominator $-(a-c)$ times. Again since $c-a$ and $c-b$ in the denominator of the third fraction go into $a-c$ and $b-c$ respectively in the common denominator -1 times each, then $(c-a)(c-b)$ goes into $(a-b)(a-c)(b-c)$, $+(a-b)$ times. Now do questions 1-30, pages 195 and 196.

Grade XI Physics

SOUND

1.—The Origin of Sound. Whenever one speaks, plucks the string of a musical instrument, blows a whistle, or strikes a body with a hammer, a result arises which impresses itself on the sense of hearing. This result is known as sound. That the body emitting the sound is vibrating in each case can easily be proved. If one holds the tips of the fingers against the throat over the larynx when speaking, he can feel the vibrations; small paper riders placed on the strings of an instrument will be thrown off when it is plucked; salt sprinkled on paper and held in front of a whistle will be caused to jump about; and a small coin placed beside the spot struck by the hammer will be caused to jump. One may thus conclude *"that sound arises from matter in rapid vibration"*.

2.—What Carries Sound. Place an electric bell or an alarm clock in a bell jar in such a way that the bell hangs on several coils of light wire or rests on a thick rubber pad. Exhaust the air from the bell jar with an air pump or an aspirator. As the air becomes exhausted it is noticed that the sound becomes much weaker or dies entirely away while the hammer can still be seen striking the gong. Such an experiment leads to the conclusion *that sound cannot travel through a vacuum*, or, in other words, *that sound requires a material substance for its transmission.*

That air carries sound is one of the commonest experiences. All ordinary sounds are brought to the ear through the air. That water will carry sound can be determined by two boys in swimming. If one ducks his head under the water at one end of the pool while another strikes two stones together under the water at the other end, the first boy will hear the sound through the water even better than he would at the same distance through air. In the classroom this fact can be demonstrated by placing a thin, broad cork on the stem of a tuning fork. The tuning fork is then made to vibrate by striking the prongs. The stem of the fork with the cork at its bottom end is held so that the cork is against the surface of some water in a beaker on the desk. The sound immediately seems to arise from the desk, showing that the vibrations of the tuning fork fork are transmitted by the water from the fork to the desk. That solids carry sound may best be illustrated by placing a watch on the end of a piece of wood at least ten feet long. When the ear is placed close to the other end of the stick the sound of the watch is heard distinctly. When the ear is some distance from the wood the ticking is heard only faintly or not at all. The above series of experiments show *"that all classes of matter, i.e., gases, liquids, and solids, transmit or carry sound"*.

3.—Velocity of Sound. The velocity of sound in air was first determined by sounding cannons at stations about 17 miles apart. The

cannon at station A was observed to be fired from station B by the flash, and the time noted until the sound was heard. The cannon at B was then fired and observed from station A. This measuring of the velocity of sound in both directions eliminated errors which would arise due to the direction and velocity of the wind. There is no direct, simple method by which the velocity of sound can be measured in the schoolroom, but an experiment similar to the one outlined above can easily be performed by any two pupils outside. A mile apart would be a suitable distance. Since the original experiment was performed, other experiments conducted with more scientific equipment have shown the velocity of sound in air at 0° C. and 76 cm. pressure to be 1087 feet per second. The velocity in water is 4.5 times as great as that in air, while the velocity in steel is 15 times that in air. It has also been found that the velocity of sound in air increases by two feet per second for each degree centigrade rise in temperature, and is not affected by changes in pressure.

4.—How Sound Travels. As has been observed in the previous sections, sound requires a material substance for its transmission and it travels through such substance with a velocity which depends upon its nature, yet it is readily observed that nothing of a material nature is transmitted through the substance. The fact points to the suggestion that when sound travels it is merely the vibrations or the manner of motion which is transmitted. Such vibrations are called sound waves. One therefore states *that sound travels by means of sound waves.*

5.—Water Waves. Sound waves being invisible are difficult to study. It is therefore advisable to commence the study of wave motion with that of water waves. When a stone is thrown into a pond of water with a smooth surface a disturbance is created. The water pushed out of the way by the stone rises in a crest around the stone. As the stone sinks it rushes in to fill the hole and forms a trough. It then meets in the centre and rises to form a second crest. Thus from the point where the stone entered the pond an ever-increasing circle of alternating crests and troughs extend outward. Such alternate crests and troughs are called *waves.* Fig. 1 represents an instantaneous state of such water waves. The motion of the waves is in the direction indicated. Note that the points A and C are moving down, while points B and D are moving upward. The motion of a single particle of water is an oscillatory one, up and down, in a circular or elliptical path. Particles having corresponding motions are said to be in the same phase. The wave length is the distance from any particle to the next particle in the same phase. The amplitude (d) of the wave vibration is one half the vertical distance from trough to crest.
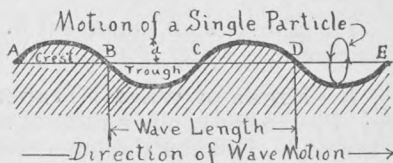
Fig. 1

Since in physics a correct conception of wave motion is of extreme importance in the study of a great many phenomena, considerable time and effort should be put on this part of the work. Actual wave motion should be observed. An apparatus such as that shown in Fig. 2 may be built by any good student and used to demonstrate wave motion in the school. The glass-bottomed tray should be not less than 10x18
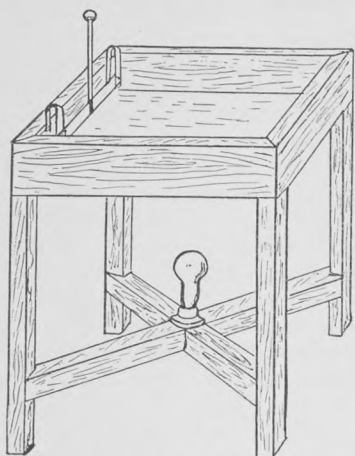
Fig. 2

inches. The corners of the frame and the edges of the glass are sealed watertight with roofing cement. A vibrator is then built at one end, the springs being built of hacksaw blades. These should be softened by heating them red hot and allowing them to cool slowly before bending or drilling. The weight may be any metal rod with a rubber stopper sliding along it. The tray should be supported on legs and a 100 watt electric light should be placed underneath it. In use one-quarter inch of water is placed in the tray. The room is darkened and the vibrator started. A train of waves, much enlarged, will be thrown on the ceiling of the room where they can be studied. Besides showing ordinary transmission of energy by wave motion, reflection and refraction of waves may be studied with such a tank.

6.—Relation Existing Between Wave Length, Frequency, and Velocity. When a stone is thrown into a pool it is noted that a single wave crest leaves the centre and travels in an ever-increasing circle until it strikes the edge. Any particular point on any one crest seems to move out radially until it is stopped by the bank. The distance which this point will travel in one second is called its *velocity* (**v**). The number of crests which will pass a single point in one second is the *frequency* (**n**).
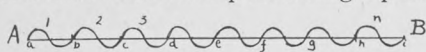
Fig. 3

A moment's study of Fig. 3 will show that if AB is the velocity or distance the waves moved in one second; ab, bc, etc. each equal to (**l**) the wave length and (**n**) equal to the frequency or number of waves passing A in one second, then Velocity =frequency×Wave length or **v=nl**

The above is an important formula and holds true for all forms of wave motion—water, sound, and light.

7.—Kinds of Waves: Transverse, Longitudinal, and Stationary. Fasten one end of a piece of rope or rubber tubing 10 or 20 feet long to the wall. Holding the other end cause a wave to pass along the tube by moving the hand with a quick up and down motion. Such a wave consists of a crest and a trough. The motion of the particles in the tube is at right angles to the direction of motion of the waves. Such a wave is known as a transverse wave. Water waves are an example of transverse waves.

Have two students hold a long coiled spring before the class. Near the centre of the spring tie a colored bit of cloth. Have one of the students place his hand on the spring and with a quick forward motion cause the coils of wire at his end to be driven closer together. They will be seen to move and a compression followed by a rarefaction will be seen to travel along the coiled spring. The colored bit of cloth in the centre will be seen to jerk slightly to and fro as the compression and rarefaction parts of the wave pass over it. The to and fro motion is in the same line

as the direction of travel of the wave. Such waves are known as longitudinal waves. Sound waves are of this kind.

Set up the apparatus shown in Fig. 4. A is the vibrator of an electric bell, B a length of silk fish line, C a pulley and D a weight. When the bell is started vibrating, waves are set up in the fishline which on striking the pulley are reflected. There is t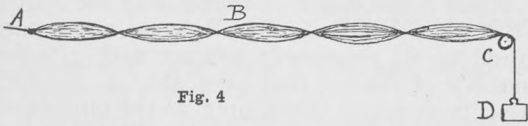hus in the string at one time two sets of similar transverse waves, travelling in opposite directions. This causes the line to break up into places where the vibrations are opposite and cancel each other, forming a part where there is no motion, called a *node*, and places where the vibrations are in the same direction and reinforce each other, causing increased motion, known as a *loop*. The appearance of the string is that of a train of waves at any moment, there being no visual evidence of the presence of the two trains of waves. Such waves are known as stationary or standing waves. The wave length is twice the distance between two nodes or two loops. The vibrations of wires and air columns in musical instruments are of this nature.

8.—Sound Waves. Let us think of the vibrating body (Fig. 5) as sending out sound waves.
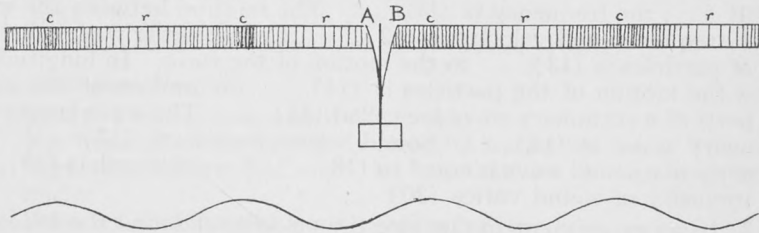
Fig. 5

As the body vibrates from A to B, the air on the side toward B will be compressed, while that on the A side will be rarefied. · Thus a condensation phase will go out from the vibrating body on the side B and a rarefaction phase on the side A. As the body vibrates from B to A the opposite will be the case. Thus do sound waves travel out from a sounding body. They will consist of condensations and rarefactions. · The motion of the particles will be to and fro along the motion of the wave. Thus sound waves are longitudinal waves consisting of alternate condensations and rarefactions. The successive condensations and rarefactions in a cross section of a sound wave emitted from a vibrating body are labelled c and r in Fig. 5. The curve below shows the means of representing these graphically. Thus the crest of the curve represents a condensation and the trough a rarefaction. A complete sound wave consists of a condensation and a rarefaction. The distance between two points in the same phase of motion in any two adjacent waves is called a wave length. In sound the frequency of the wave will be the number of vibrations of the sounding body. Thus if we have a tuning fork vibrating 256 times per second and the velocity of sound at 20° C is 1127 feet per second, the wave length may be found by applying the formula $v = nl$. It is found to be $1127/256 = 4.4$ feet.

9.—Loudness or Intensity of Sound. It is part of the experience of everyone that the nearer one is to the source of a sound the louder the sound is. This is because the energy of vibrations occupies a smaller space and fewer particles of matter must be set in motion. If the origin of sound is at the centre of a one foot cube, all particles in the one cubic foot would receive energy. While if the origin of sound is at the centre of a three foot cube, all particles in the cube or nine times as many particles would receive energy and would necessarily vibrate with 1/9 the amplitude. Thus if at the outside of the one foot cube, that is, one-half foot from the source, the intensity of sound is one unit, at the outside of a three foot cube, that is 1½ feet from the source, the intensity of sound would be 1/9 unit. It is thus seen that the intensity of sound varies inversely as the square of the distance from the source. Thus at five feet from the source of a sound the intensity would be 1/25 that at one foot from the source.

10.—Test. 1. Make a numbered list of the words required to complete the following statements correctly.

Sound originates from (1)......... It requires a (2)......... for its transmission. Sound travels in (3)......... of matter. Sound travels in water (4)......... than it does in air. Sound travels in air at the rate of (5)......... The velocity of sound increases (6)......... for each rise of 1°C in temperature. Sound travels by means of (7)......... In wave motion no (8)......... moves forward. The amplitude of a vibration is (9).........; the velocity is (10).........; the frequency is (11)......... The relation between the wave length frequency and velocity is (12)......... In transverse waves the motion of particles is (13)......... to the motion of the wave. In longitudinal waves the motion of the particles is (14)......... the motion of the wave. The parts of a stationary wave are called (15)......... The wave length of a stationary wave is (16)......... Sound waves consist of (17)......... The frequency of a sound wave is equal to (18......... A wave length is (19).......... The intensity of sound varies (20)..........

2. In an experiment to measure the velocity of sound the following observations were made. Distance A to B observing stations is 5280 feet. Temperature 20°C. Time from seeing flash of gun to hearing of sound A to B—4.4 seconds. Time from seeing flash of gun to hearing of sound B to A—4.8 seconds.

(a) Show how you would use these observations to calculate the velocity of sound.

(b) Account for the difference in the two observed times.

3. What is the wave length of the sound produced by a tuning fork which vibrates 380 times per second on a day when the temperature is 15°C?

Answers to 1.— (1) vibrating bodies. (2) material substance. (3) all classes. (4) faster. (5) 1087 ft. per sec. at 0°C. (6) 2 ft./sec. (7) waves. (8) material substance. (9) one-half the vertical distance from crest to trough. (10) the distance a point on a wave travels forward in one second. (11) the number of waves passing a point in one second. (12) velocity=frequency times wave length or v=nl. (13) at right angles. (14) to and fro along. (15) nodes and loops. (16) two times the distance from node to node or loop to loop. (17) condensations and rarefactions. (18) the number of vibrations per second of the sounding body. (19) the distance from a particle in one phase to the next particle in the same phase. (20) inversely as the square of the distance.

Examination Solutions

GRADE X FRENCH, 1935 (Sask.)

1. Dictation: The New Fraser and Squair French Grammar, page 81, sentences 1 to 8 inclusive.

   The teacher should read these sentences in French three times; first, to give the pupils the general idea of the sentences; second, to enable the pupils to write them; third, to give the pupils an opportunity to check their work.

   Pupils must write the sentences in French.

2. Translate into French:
   (a) a silk dress; the whole day; in French; the evening paper; an English lesson; at once.
   (b) Give the plural form of: mois, cheval, nez, pied, chapeau, rue.
   (c) Give the feminine form of: long, gros, ancien, heureux, faux, cruel.

   Answer:
   (a) une robe de soie; toute la journée; en français; le journal du soir; une leçon d'anglais; tout de suite.
   (b) mois, chevaux, nez, pieds, chapeaux, rues.
   (c) longue, grosse, ancienne, heureuse, fausse, cruelle.

3. Translate into English:
   (a) J'aime à marcher quand il fait froid.
   (b) J'ai besoin de huit heures de sommeil toutes les nuits.
   (c) Après le déjeuner j'ai visité les bois et les champs avec mon oncle.
   (d) Voici les légumes que nous avons achetés.
   (e) Je vais être content de manger quelque chose.
   (f) Nous sortirons tout de suite parce que nous ne voulons pas être en retard.

   Answer.
   (a) I like to walk when it is cold.
   (b) I need eight hours of sleep every night.
   (c) After dinner I visited the woods and fields with my uncle.
   (d) Here are the vegetables which we bought.
   (e) I shall be glad to eat something.
   (f) We will go out immediately because we do not want to be late.

4. Translate into French:
   (a) She has come (venir); You were writing (écrire); He will go to bed (se coucher); I am thinking (penser); You are making (faire); We have finished (finir).
   (b) Give the infinitive of: je me lavais; vous aurez; il a été; nous irons.

   Answer.
   (a) Elle est venue; vous écriviez; il se couchera; Je pense; vous faites; Nous avons fini.
   (b) se laver; avoir; être; aller.

5. Translate into French:

(a) It is windy; (b) How old are you?; (c) It is they; (d) What is your name?; (e) I was very hungry; (f) Do you come from Paris?

Answer.

(a) Il fait du vent; (b) Quel âge avez-vous?; (c) Ce sont eux (elles); (d) Comment vous appelez-vous?; (e) J'avais très faim; (f) Venez-vous de Paris?

6. Translate into French:

(a) I worked two hours yesterday evening.
(b) I shall get up at seven o'clock tomorrow morning.
(c) Are there any pupils in the classroom? Yes, there are ten.
(d) The car went rapidly and we got home before sunset.
(e) How long have your friends been here?
(f) After these walks I was tired, but I had an excellent appetite.

Answer.

(a) Je travaillais depuis deux heures hier soir.
(b) Je me lèverai à sept heures demain matin.
(c) Y a-t-il des élèves dans la classe? Il y en a dix.
(d) L'automobile a marché vite and nous sommes arrives chez nous avant le coucher du soleil.
(e) Depuis quand vos amis sont-ils ici?
(f) Après ces promenades j'étais fatigue, mais j'avais un excellent appétit.

7. Write in French a composition of about fifty words on any one of the following topics: Our Garden; Shopping in the City; A Visit to the Farm; Going to Market; A Character Sketch of Ted Bopp.

8. Translate into English:

Ce matin nous avons été au "Bon Marche" un magasin célèbre de Paris. Un de mes cousins a demandé des mouchoirs, des faux-cols et des cravates. Il a acheté une très jolie cravate en soie. Enfin nous avons acheté des bonbons pour nos petites cousines et nous sommes rentrés chez nous. Je vais voir pièce de Molière au théâtre ce soir. Nous entrerons dans la salle à huit heurres et nous trouverons nos places. S'il fait beau temps nous irons à pied; s'il fait mauvais, nous prendrons un autobus ou le tramway. C'est à ce coin-là que nous attendrons l'autobus. On sort très tard du théâtre à Paris. Nous avons beaucoup couru ce matin. Il est fatigant de courir nuit et jour et nous serons bien contentes quand nous serons au lit.

Answer.

This morning we were at "Bon Marche" a famous store in Paris. One of my cousins asked for handkerchiefs, collars and neckties. He bought a very pretty silk necktie. Then we bought some candy for our young cousins, and returned home. I am going to see a play by Moliere at the theatre this evening. We will go into the hall at eight o'clock and find our seats. If it is fine we will go on foot; if it is bad weather, we will take a bus or a street car. At that corner over there we will wait for the bus. People come out of the theatre very late in Paris. We ran about a great deal this morning. It is fatiguing to rush night and day, and we will be very glad when we are in bed.

GRADE IX ALGEBRA AND GEOMETRY, 1935 (Sask.)

1. In the expression $x^3 + 2x^2 - 5x - 6$
   (a) What is the power of x in the second term?
   (b) What is the index in the first term?
   (c) What is the coefficient of x?
   (d) Find the numerical value of the expression when $x = 1$, $x = -2$.

   Answer:
   (a) The second power. (b) 3. (c) -5.
   (d) $x^3 + 2x^2 - 5x - 6 = 1 + 2 - 5 - 6 = -8$ when $x = 1$
   $x^3 + 2x^2 - 5x - 6 = -8 + 8 + 10 - 6 = 4$ when $x = -2$.

2. Simplify:
   (a) $(6x^2 - 3x + 5) + (2x^2 - 5x - 5) - (5x^2 - 8x + 2)$.
   (b) $\dfrac{ab - ac}{-a} + \dfrac{bc - ab}{-b}$.

   Answer:
   (a) $6x^2 - 3x + 5) + (2x^2 - 5x - 6) - (5x^2 - 8x + 2)$
   $= 6x^2 - 3x + 5 + 2x^2 - 5x - 6 - 5x^2 + 8x - 2$
   $= 3x^2 - 3$
   (b) $\dfrac{ab - ac}{-a} + \dfrac{bc - ab}{-b} = \dfrac{-ab^2 + abc - abc + a^2b}{ab} = \dfrac{a^2b - ab^2}{ab}$
   $= \dfrac{ab(a - b)}{ab} = (a - b)$

3. Factor:
   (a) $x - 2x - 15$. (b) $15x^2 - 10xy$. (c) $4m^2 - n^2$.

   Answer:
   (a) $x^2 - 2x - 15 = (x - 5)(x + 3)$
   (b) $15x^2 - 10xy = 5x(3x - 2y)$
   (c) $4m^2 - n^2 = (2m + n)(2m - n)$.

4. Solve and verify the results:
   (a) $1/6x + y = 6$ (b) $(x + 4)(x - 3) - (x + 2)(x + 1) = 42$
   $x + y/2 = 14$

   Answer:
   (a) $1/6x + y = 6$ (1)   From (1) $x + 6y = 36$ (3)
   $x + y/2 = 14$ (2)   From (2) $2x + y = 28$ (4)
   Multiply (3) by (2), $\therefore 2x + 12y = 72$ (3)
   Subtract (5) from (4) $-11y = -44$
   $y = 4$
   Substitute in (1) $1/6x + 4 = 6$ $\therefore 1/6x = 2$ $\therefore x = 12$.
   Verify in (2) $12 + 2 = 14$ $\therefore 14 = 14$
   (b) $(x + 4)(x - 3) - (x + 2)(x + 1) = 42$
   $\therefore x^2 + x - 12 - (x^2 + 3x + 2) = 42$
   $\therefore x^2 + x - 12 - x^2 - 3x - 2 = 42$
   $-2x - 14 = 42$
   $-2x = 56$
   $x = -28$

5. A merchant sells 33 suits, some at $35 each and others at $25 each, and receives $945. How many did he sell at each price?

   Answer:
   Let x be the number of suits sold at $35 each.

Let y be the number of suits sold at $25 each.

$\therefore x+y=33$ (1)

and $35x+25y=945$ (2)

$\therefore 35x+35y=1155 \qquad \therefore -10y=-210 \qquad \therefore y=21$

$\therefore x=12$ Hence 12 suits sold at $35 and 21 at $25 each.

6. Prove that if two triangles have the three sides of the one equal to the three sides of the other, each to each, they are equal in all respects.

Answer:
See Theorem 4, page 62, text.

7. (a) Define and illustrate by means of a diagram: angle, perpendicular lines, supplementary angles.

(b)
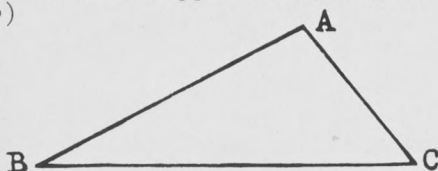
Name, measure and state the lengths of the sides of the triangle ABC. Is the triangle ABC equilateral, isosceles or scalene? Why?

(c) With your protractor measure the angles ABC, ACB, and BAC. Is the triangle ABC right-angled, obtuse-angled, or acute-angled? How do you decide?

(d) Name the greatest side and the greatest angle of the triangle ABC. Make a statement giving the relative positions of the greatest side and the greatest angle.

Answer:

(a) An *angle* is the amount of turning which one arm must make to reach the position of the other.
Perpendicular lines are lines that meet at right angles.
Supplementary angles are angles whose sum makes 180°.

(b) AB = 3.7 cm, AC = 2.2 cm, BC = 4.7 cm.
The triangle is scalene because it has three unequal sides.

(c) $\angle B = 28°$, $\angle C = 50°$, $\angle A = 102°$.
The triangle is obtuse-angled because it contains an obtuse angle at A.

(d) The greatest side is BC and the greatest angle is A. The greatest side is opposite the greatest angle.

8. In an isosceles triangle ABC on base BC, the side BA is produced to E and the side CA is produced to F so that AE = AF. FB and CE are joined. Prove that BF = CE.

Answer:
Given ABC an isosceles triangle with AB = AC and given that BA and CA are produced to E and F, respectively, making AE = AF.
Prove that FB = EC.
Construction. Join FB and CE.
Proof: In triangles FAB and CAE,
$$FA = EA, \qquad \text{given}$$
$$AB = AC \qquad \text{given}$$
and $\angle FAB = \angle EAC$ Th. 1.
$\therefore$ the triangles are congruent Th. 2.
$\therefore FB = EC.$

9. Show how to bisect a given straight line and prove theoretically that the line is bisected.

Answer:
See Problem 2, page 68, text.

10. In surveying a park it is required to find the distance between two points A and B; but as a lake intervenes, a direct measurement cannot be made. The surveyor therefore takes a third point C, from which both A and B are accessible, and he finds CA = 245 yards, CB = 320 yards, and the angle ACB = 42°. Ascertain from a plan the approximate distance between A and B.

Answer:
Use 1 cm. to represent 100 yds. Take a point C and from it draw a line 2.45 cm. in length. At C make an angle ACX equal to 42°. From C in CX cut off CB equal to 3.2 cm. Join BA. Measure BA and it should approximate 2.2 cm. ∴ the approximate distance between A and B is 220 yards.

11. Draw carefully a triangle whose sides are 3″, 4″ and 5″, respectively. Measure the greatest angle. Calculate the area of the triangle.
OR
Prove that of all straight lines drawn from a point to a given straight line the perpendicular is the least.

Answer:
Draw a triangle ABC with AB = 3″, AC = 4″, and BC = 5″. The greatest angle is A, it being 90°. The area of the triangle is 1/2 the product of AC and AB, namely, $1/2 \times 4 \times 3 = 6$ sq. in.
OR
Let A be the given point and BC the given straight line;
let AM be the perpendicular from A to BC.
Let AQ be any other line from A to BC.
Now in the triangle AMQ ∠AMQ = 90°.
∴ ∠AMQ is the greatest angle in the triangle.
∴ AQ is the greatest side.
That is, AM is less than AQ, any line from A to BC.
∴ AM, the perpendicular, is the shortest line that can be drawn from A to BC.

Modern Classroom Aids

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